# Is the debt bubble supporting the world economy in danger of collapsing?

Posted on May 17, 2022 by Gail Tverberg

The years between 1981 and 2020 were very special years for the world economy because interest rates were generally falling:

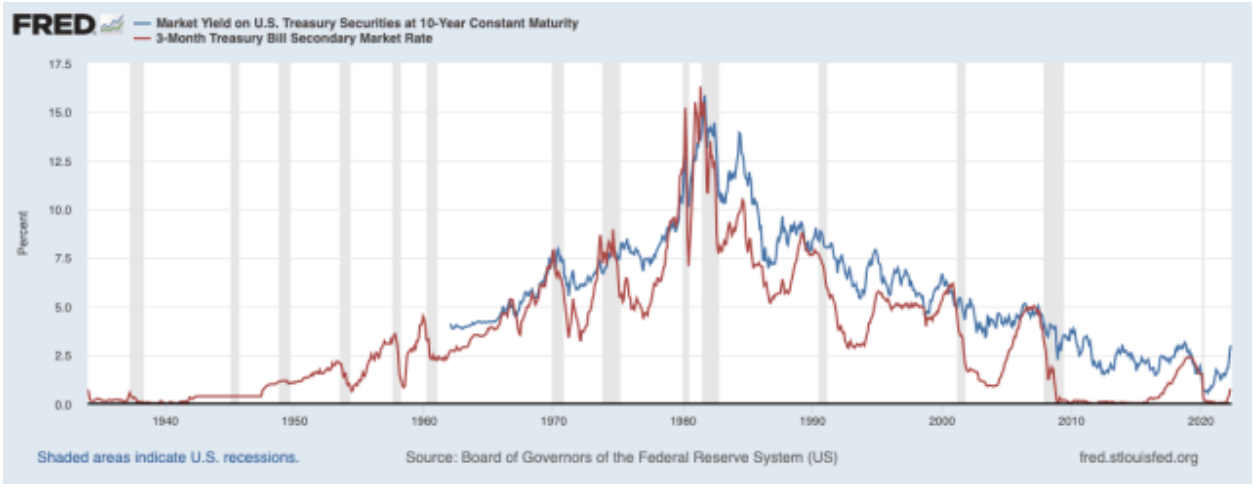


Figure 1. Yields on 10-year and 3-month US Treasuries, in a chart made by the Federal Reserve of St. Louis, as of May 10, 2022.

In some sense, falling interest rates meant that debt was becoming increasingly affordable. The monthly out-of-pocket expense for a new $500,000 mortgage was falling lower and lower. Automobile payments for a new $30,000 vehicle could more easily be accommodated into a person's budget. A business would find it more affordable to add $5,000,000 in new debt to open at an additional location. With these beneficial effects, it would be no surprise if a debt bubble were to form.

With an ever-lower cost of debt, the economy has had a hidden tailwind pushing it long between 1981 to 2020. Now that interest rates are again rising, the danger is that a substantial portion of this debt bubble may collapse. My concern is that the economy may be heading for an incredibly hard landing because of the inter-relationship between interest rates and energy prices (Figure 2), and the important role energy plays in powering the economy.

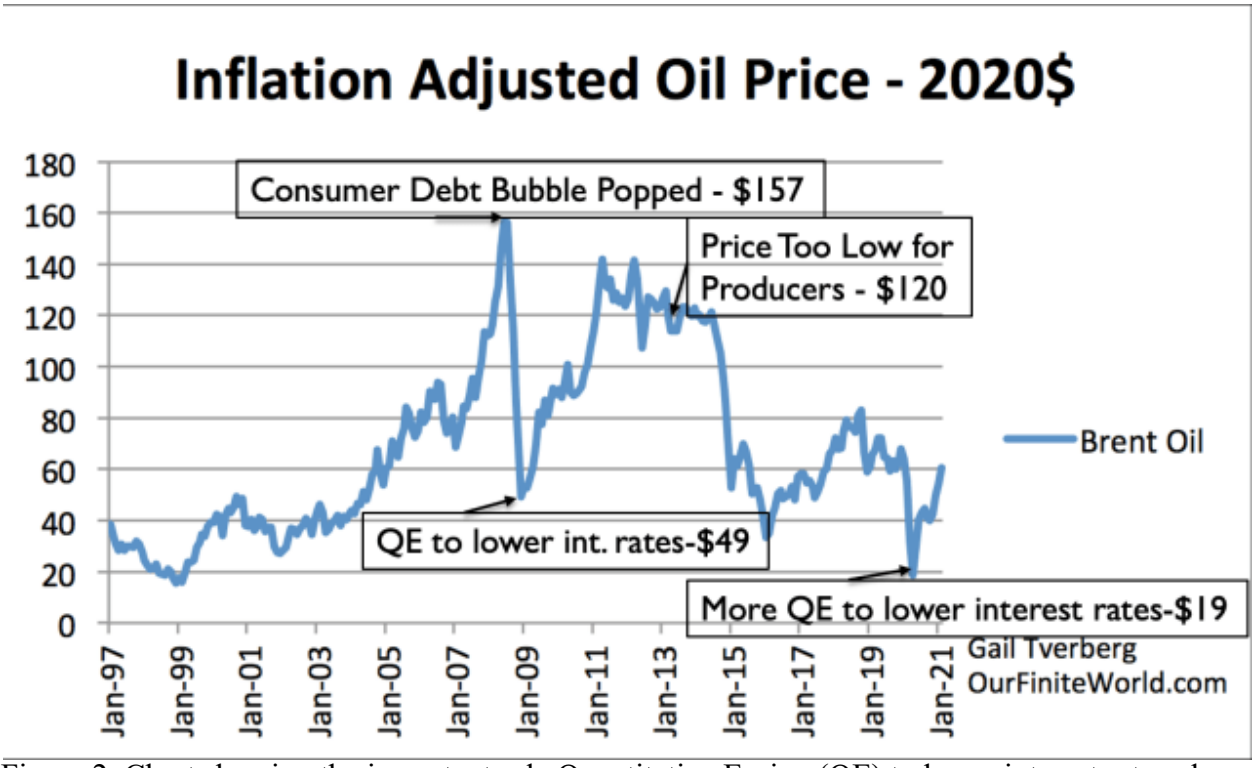


Figure 2. Chart showing the important role Quantitative Easing (QE) to lower interest rates plays in adjusting the level of "demand" (and thus the selling price) for oil. Lower interest rates make goods and services created with higher-priced oil more affordable. In addition to the items noted on the chart, US QE3 was discontinued in 2014, about the time of the 2014 oil price crash. Also, the debt bubble crash of 2008 seems to be the indirect result of the US raising short term interest rates (Figure 1) in the 2004 to 2007 period.

In this post, I will try to explain my concerns.

**[1] Ever since civilization began, a combination of (a) energy consumption and (b) debt has been required to power the economy.**

Under the laws of physics, energy is required to power the economy. This happens because it takes the "dissipation" of energy to perform any activity that contributes to GDP. The energy dissipated can be the food energy that a person eats, or it can be wood or coal or another material burned to provide energy. Sometimes the energy dissipated is in the form of electricity. Looking back, we can see the close relationship between total energy consumption and world total GDP.

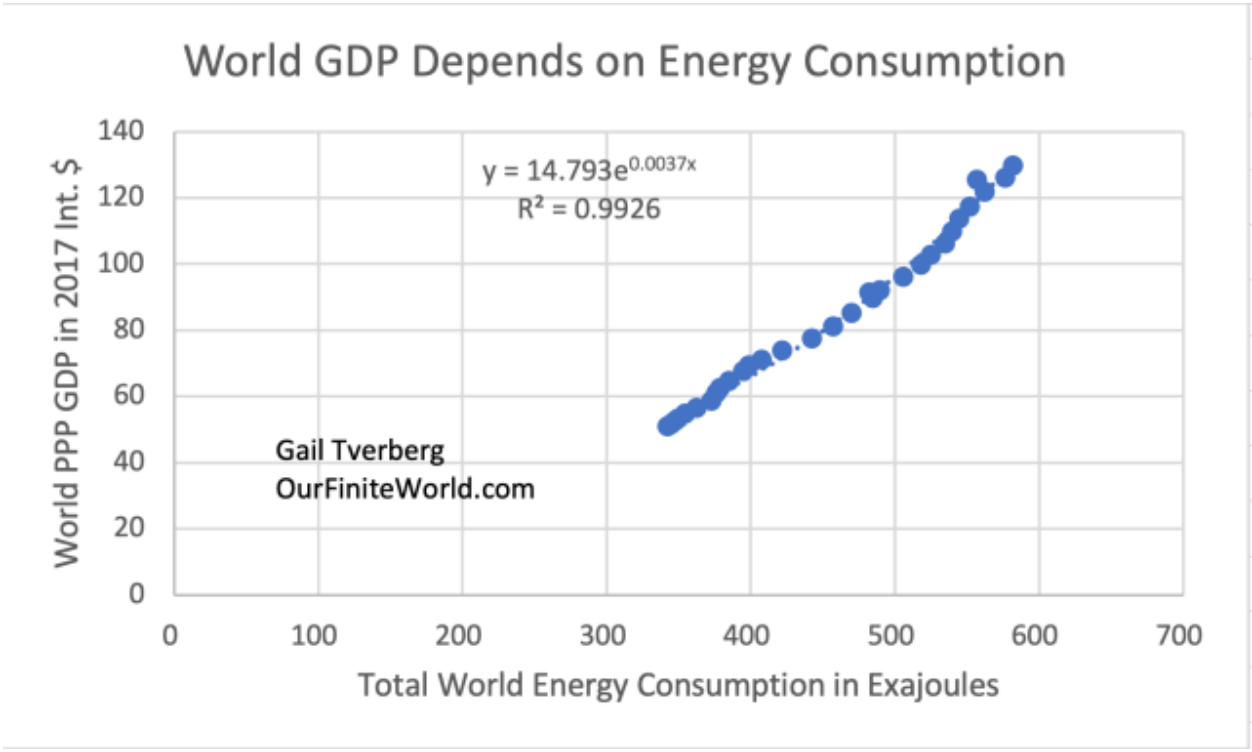


Figure 3. World energy consumption for the period 1990 to 2020, based on energy data from BP's *2021 Statistical Review of World Energy* and world Purchasing Power Parity GDP in 2017 International Dollars, as published by the World Bank.

The need for debt or some other approach that acts as a funding mechanism for capital expenditures (sale of shares of stock, for example), comes from the fact that humans make investments that will not produce a return for many years. For example, ever since civilization began, people have been planting crops. In some cases, there is a delay of a few months before a crop is produced; in other cases, such as with fruit or nut trees, there can be a delay of years before the investment pays back. Even the purchase by an individual of a home or a vehicle is, in a sense, an investment that will offer a return over a period of years.

With all parts of the economy benefiting from the lower interest rates (except, perhaps, banks and others lending the funds, who are making less profit from the lower interest rates), it is easy to see why lower interest rates would tend to stimulate new investment and drive up demand for commodities.

Commodities are used in great quantity, but the supply available at any one time is tiny by comparison. A sudden increase in demand will tend to send the commodity price higher because the quantity of the commodity available will need to be rationed among more would-be purchasers. A sudden decrease in the demand for a commodity (for example, crude oil, or wheat) will tend to send prices lower. Therefore, we see the strange sharp corners in Figure 2 that seem to be related to changing debt levels and higher or lower interest rates.

**[2] The current plan of central banks is to raise interest rates aggressively. *My concern is that this approach will leave commodity prices too low for producers*. They will be tempted to decrease or stop production.**

Politicians are concerned about the price of food and fuel being too high for consumers. Lenders are concerned about interest rates being too low to properly compensate for the loss of value of their investments due to inflation. The plan, which is already being implemented in the United States, is to raise interest rates and to significantly reverse Quantitative Easing (QE). Some people call the latter Quantitative Tightening (QT).

The concern that I have is that aggressively raising interest rates and reversing QE will lead to *commodity prices that are too low for producers*. There are likely to be many other impacts as well, such as the following:

- Lower energy supply, due to cutbacks in production and lack of new investment
- Lower food supply, due to inadequate fertilizer and broken supply lines
- Much defaulting of debt
- Pension plans that reduce or stop payments because of debt-related problems
- Falling prices of stock
- Defaults on derivatives

**[3] My analysis shows how important increased energy consumption has been to economic growth over the last 200 years. Energy consumption per capita has been growing during this entire period, except during times of serious economic distress.**

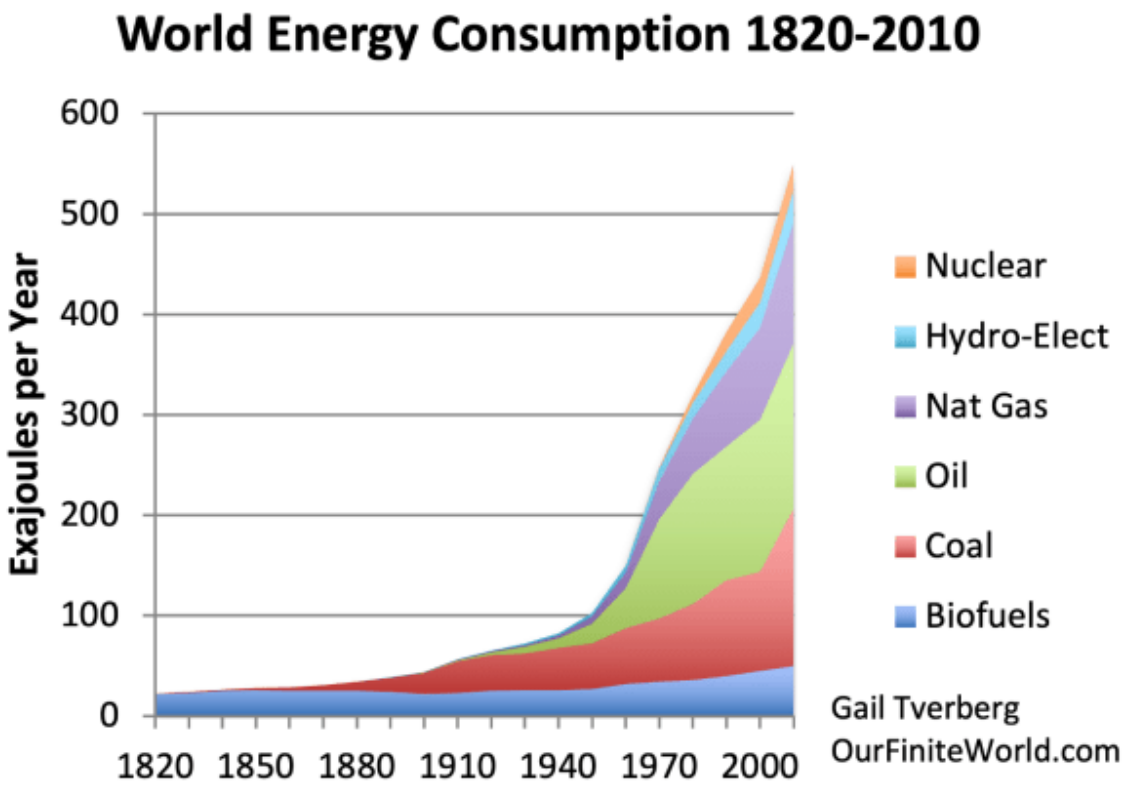


Figure 4. World energy consumption from 1820-2010, based on data from Appendix A of Vaclav Smil's *Energy Transitions: History, Requirements and Prospects* and *BP Statistical Review of World Energy* for 1965 and subsequent. Wind and solar energy are included in "Biofuels."

Figure 4 shows the amazing growth in world energy consumption between 1820 and 2010. In the early part of the period, the energy used was mostly wood burned as fuel. In some parts of the world, animal dung was also used as fuel. Gradually, other fuels were added to the mix.

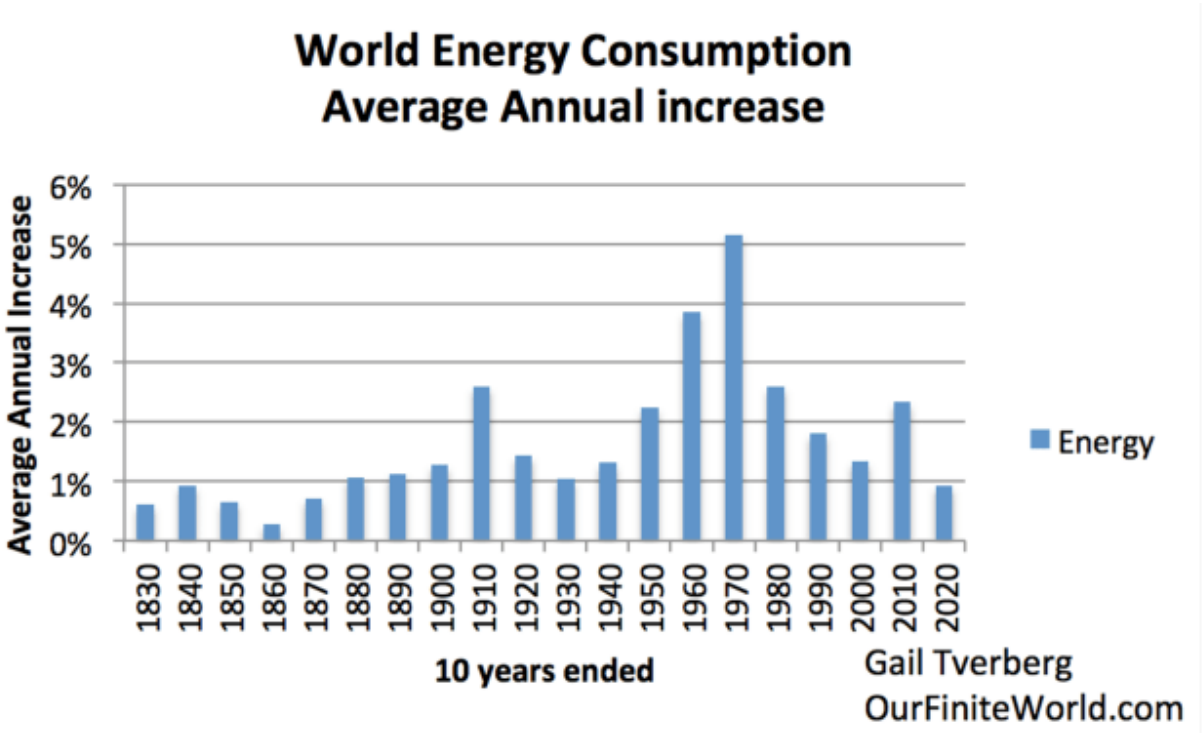


Figure 5. Estimated average annual increase in world energy consumption over 10-year periods using the data underlying Figure 4, plus similar additional data through 2020.

Figure 5 takes the same information shown in Figure 4 and calculates the average approximate annual increase in world energy consumption over 10-year periods. A person can see from this chart that the periods from 1951-1960 and from 1961-1970 were outliers on the high side. This was the time of rebuilding after World War II. Many families were able to own a car for the first time. The US highway interstate system was begun. Many pipelines and electricity transmission lines were built. This building continued into the 1971-1980 period.

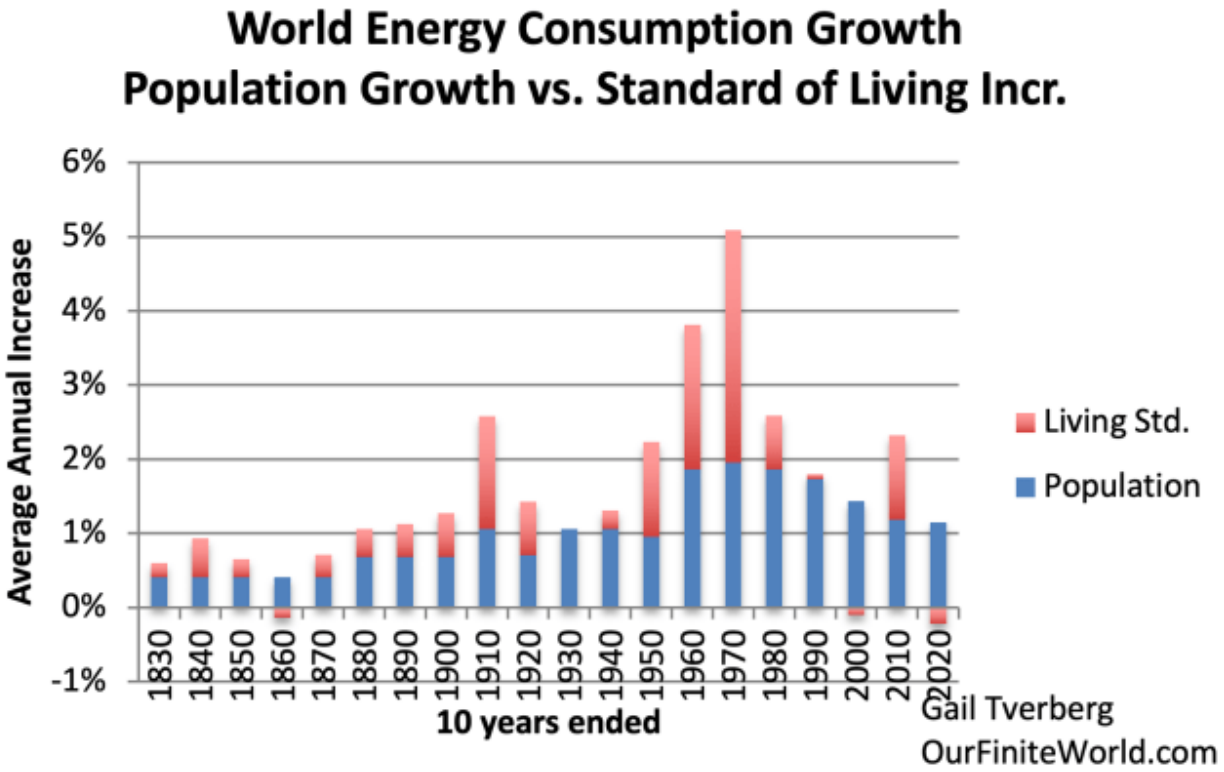


Figure 6. Same chart as Figure 5, except that the portion of economic growth that was devoted to population growth is shown in blue at the bottom of each 10-year period. The amount of growth in energy consumption "left over" for improvement in the standard of living is shown in red.

Figure 6 displays the same information as Figure 5, except that each column is divided into two pieces. The lower (blue) portion represents the average annual growth in population during each period. The part left over at the top (in red) represents the growth in energy consumption that was available for increases in standard of living.

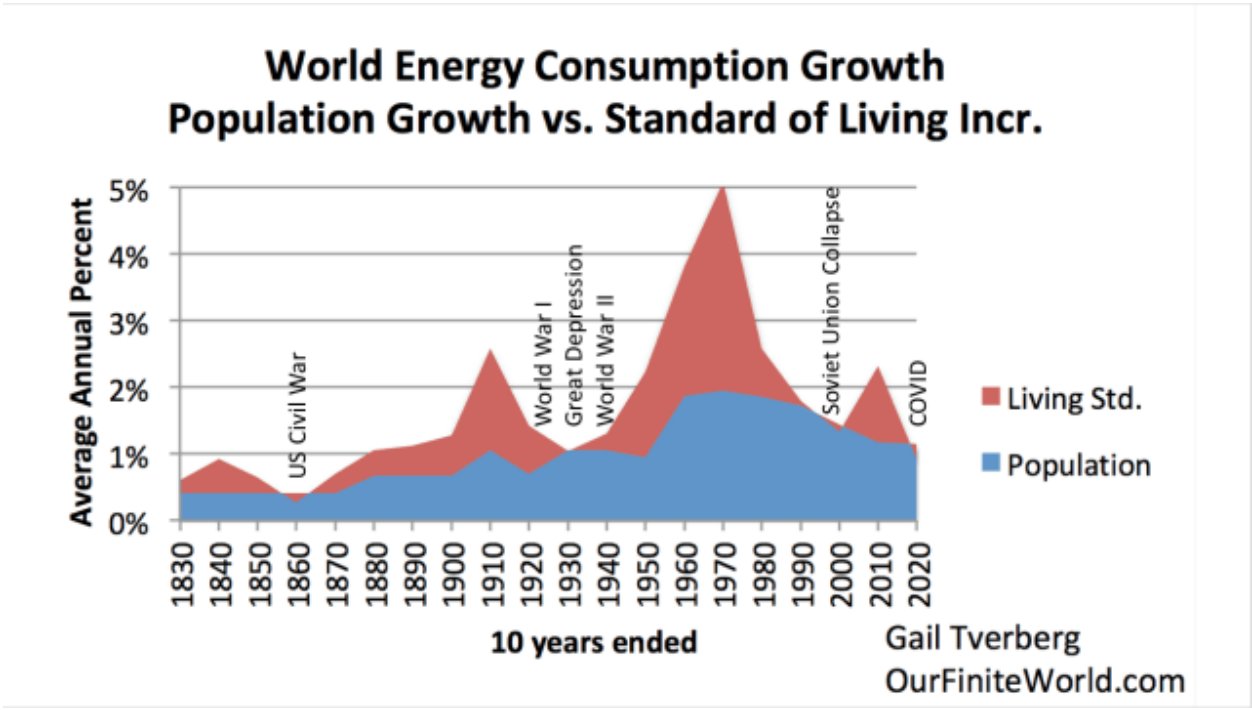


Figure 7. The same information displayed in Figure 6, displayed as an area chart. Blue areas represent average annual population growth percentages during these 10-year periods. The red area is determined by subtraction. It represents the amount of energy consumption growth that is "left over" for growth in the standard of living. Captions show distressing events during periods of low increases in the portion available to raise standards of living.

Figure 7 shows the same information as Figure 6, displayed as an area chart. I have also shown some of the distressing events that happened when growth in population was, in effect, taking up essentially all of energy consumption growth. The world economy could not grow normally. There was a tendency toward conflict. Unusual events would happen during these periods, including the collapse of the central government of the Soviet Union and the restrictions associated with the COVID pandemic.

The economy is a self-organizing system that behaves strangely when there is not enough inexpensive energy of the right types available to the system. Wars tend to start. Layers of government may disappear. Strange lockdowns may occur, such as the current restrictions in China.

**[4] The energy situation at the time of rising interest rates in the 1960 to 1980 period was very different from today.**

If we define years with high inflation rates as those with inflation rates of 5% or higher, Figure 8 shows that the period with high US inflation rates included nearly all the years from 1969 through 1982. Using a 5% inflation cutoff, the year 2021 would not qualify as a high inflation rate year.

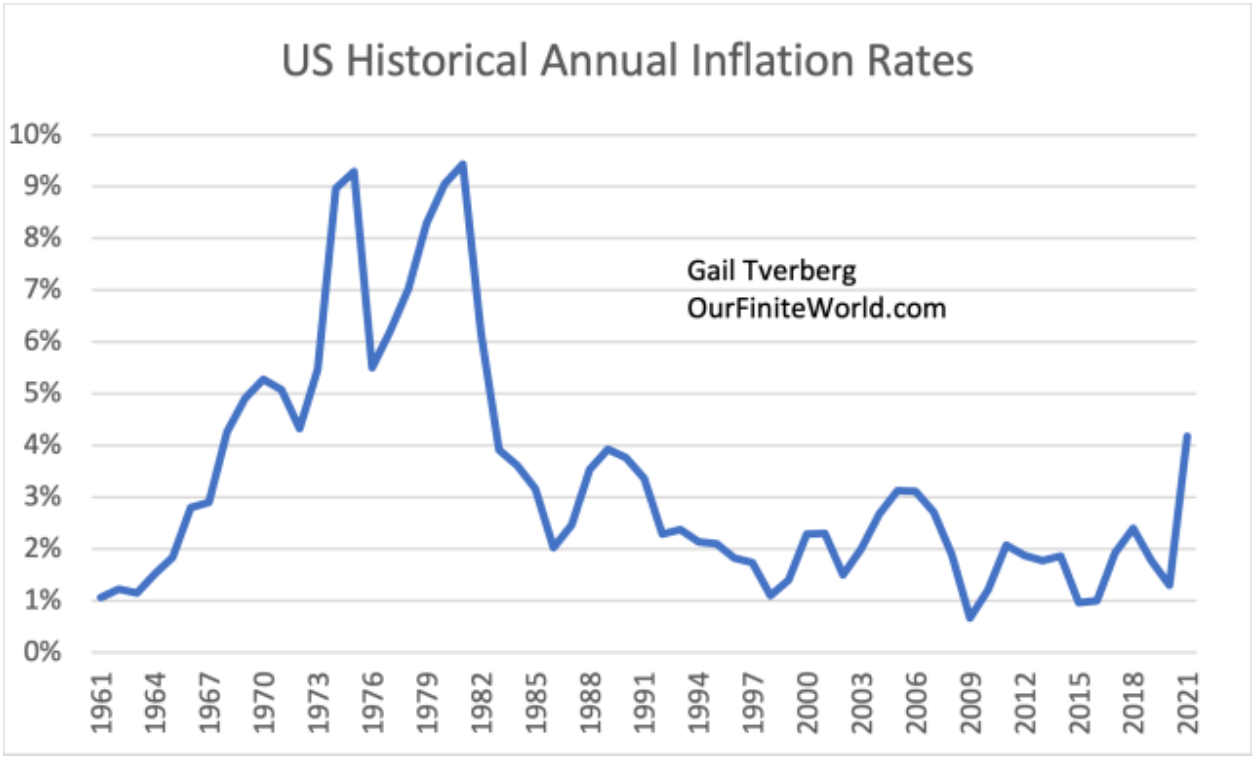

Figure 8. US inflation rates, based on Table 1.1.4 *Price Index for Gross Domestic Product,* published by the US Bureau of Economic Analysis.

It is only when we look at annualized quarterly data that inflation rates start spiking to high levels. Inflation rates have been above 5% in each of the four quarters ended 2022-Q1. Trade problems related to the Ukraine Conflict have tended to add to price pressures recently.

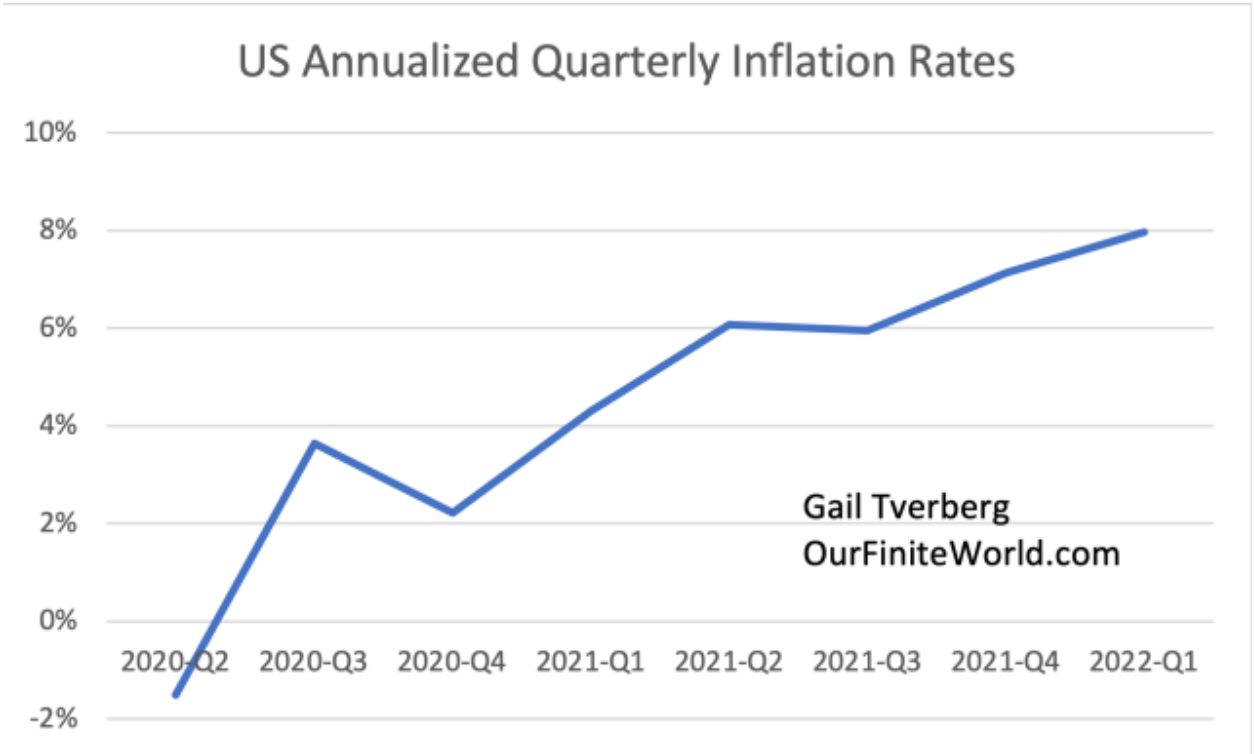


Figure 9. US inflation rates, based on Table 1.1.4 *Price Index for Gross Domestic Product,* published by the US Bureau of Economic Analysis.

Underlying these price spikes are increases in the prices of many commodities. Some of this represents a bounce back from artificially low prices that began in late 2014, probably related to the discontinuation of US QE3 (See Figure 2). These prices were far too low for producers. Coal and natural gas prices have also needed to rise, as a result of depletion and prior low prices. Food prices are also rising rapidly, since food is grown and transported using considerable quantities of fossil fuels.

The main differences between that period leading up to 1980 and now are the following:

[a] The big problem in the 1970s was spiking crude oil prices. Now, our problems seem to be spiking crude oil, natural gas and coal prices. In fact, nuclear power may also be a problem because a significant portion of uranium processing is performed in Russia. Thus, we now seem to be verging on losing nearly all our energy supplies to conflict or high prices!

[b] In the 1970s, there were many solutions to the crude oil problem, which were easily implemented. Electricity production could be switched from crude oil to coal or nuclear, with little problem, apart from building the new infrastructure. US cars were very large and fuel inefficient in the early 1970s. These could be replaced with smaller, more fuel-efficient vehicles that were already being manufactured in Europe and Japan. Home heating could be transferred to natural gas or propane, to save crude oil for places where energy density was really needed.

Today, we are told that a transition to green energy is a solution. Unfortunately, this is mostly wishful thinking. At best, a transition to green energy will need a huge investment of fossil fuels

(which are increasingly unavailable) over a period of at least 30 to 50 years if it is to be successful. See my article, Limits to Green Energy Are Becoming Much Clearer. Vaclav Smil, in his book *Energy Transitions: History, Requirements and Prospects*, discusses the need for very long transitions because energy supply needs to match the devices using it. Furthermore, new energy types are generally only add-ons to other supply, not replacements for those supplies.

[c] The types of economic growth in (a) the 1960 to 1980 period and (b) the period since 2008 are very different. In the earlier of these periods (especially prior to 1973), it was easy to extract oil, coal and natural gas inexpensively. Inflation-adjusted oil prices of less than $20 per barrel were typical. An ever-increasing supply of this oil seemed to be available. New machines (created with fossil fuels) made workers increasingly efficient. The economy tended to "overheat" if interest rates were not repeatedly raised (Figure 1). While higher interest rates could be expected to slow the economy, this was of little concern because rapid growth seemed to be inevitable. The supply of finished goods and services made by the economy was growing rapidly, even with headwinds from the higher interest rates.

On the other hand, in the 2008 to 2020 period, economic growth is largely the result of financial manipulation. The system has been flooded with increasing amounts of debt at ever lower interest rates. By the time of the lockdowns of 2020, would-be workers were being paid for doing nothing. World production of finished goods and services declined in 2020, and it has had difficulty rising since. In the first quarter of 2022, the US economy contracted by -1.4%. If headwinds from higher interest rates and QT are added, the economic system is likely to encounter substantial debt defaults and increasing breakdowns of supply lines.

**[5] Today's spiking energy prices appear to be much more closely related to the problems of the 1913 to 1945 era than they are to the problems of the late 1970s.**

Looking back at Figure 7, our current period is more like the period between the two world wars than the period in the 1970s that we often associate with high inflation. In both periods, the "red" portion of the chart (the portion I identify with rising standard of living), has pretty much disappeared. In both the 1913 to 1945 period and today, it is nearly all the energy supplies other than biofuels that are disappearing.

In the 1913 to 1945 period, the problem was coal. Mines were becoming increasingly depleted, but raising coal prices to pay for the higher cost of extracting coal from depleted mines tended to make the coal prohibitively expensive. Mine operators tried to reduce wages, but this was not a solution either. Fighting broke out among countries, almost certainly related to inadequate coal supplies. Countries wanted coal to supply to their citizens so that industry could continue, and so that citizens could continue heating their homes.

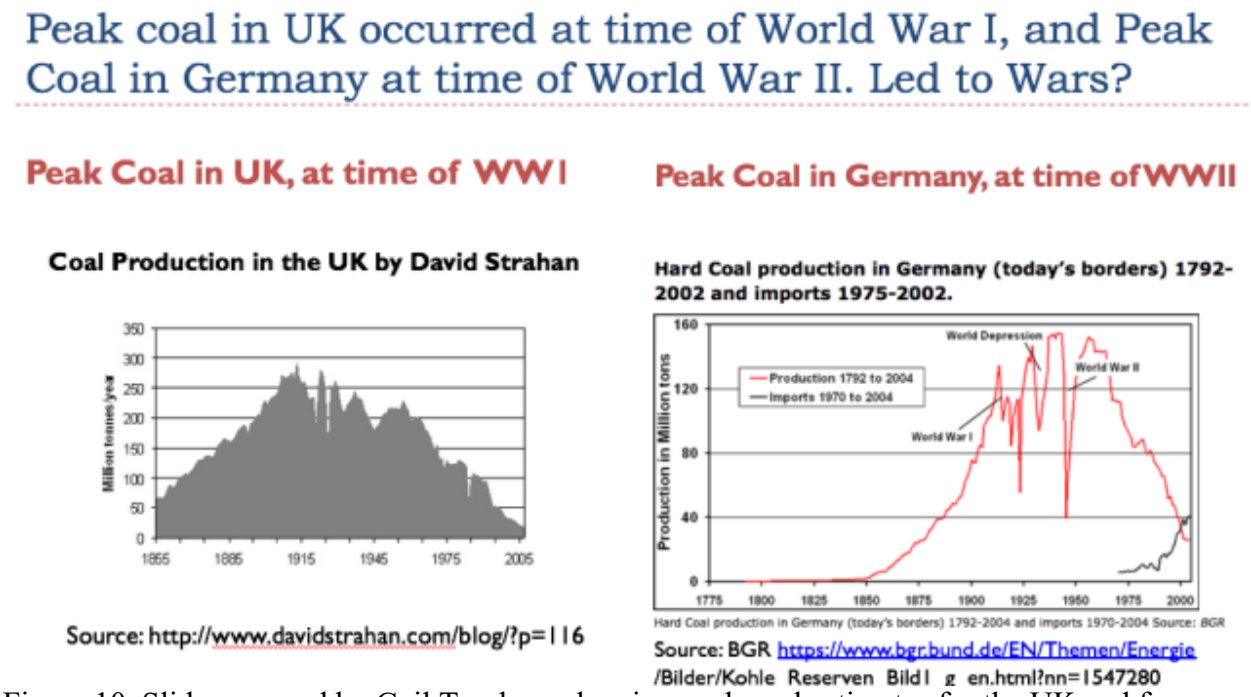

Figure 10. Slide prepared by Gail Tverberg showing peak coal estimates for the UK and for Germany.

As stated at the beginning of this section, today's problem is that *nearly all our energy supplies are becoming unaffordabl*e. In some sense, wind and solar may look better, but this is because of mandates and subsidies. They are not suitable for operating the world economy within any reasonable time frame.

There are other parallels to the 1913 to 1945 period. One of the big problems of the 1930s was prices that would not rise high enough for farmers to make a profit. Oil prices in the United States were extraordinarily low then. BP *2021 Statistical Review of World Energy*reports that the average oil price in 1931, in 2020 US$, was $11.08. This is the lowest inflation-adjusted price of any year back to 1865. Such a price was almost certainly too low for producers to make a profit. Low prices, relative to rising costs, have recently been problems for both farmers and oil producers.

Another major problem of the 1930s was huge income disparity. Wide income disparity is again an issue today, thanks to increased specialization. Competition with unskilled workers in low wage countries is also an issue.

It is important to note that the big problem of the 1930s was *deflation* rather than inflation, as the debt bubble started popping in 1929.

**[6] If a person looks only at the outcome of raising interest rates in the 1960s to 1980 timeframe, it is easy to get a misleading idea of the impact of increased interest rates now.**

If people look only at what happened in the 1980s, the longer-term impact of the spike in interest rates doesn't seem too severe. The world economy was growing well before the interest rates

were raised. After the peak in interest rates, the world economy generally continued to grow. As a result of the high oil prices and the spiking interest rates, the world hastened its transition to using a bit less crude oil per person.

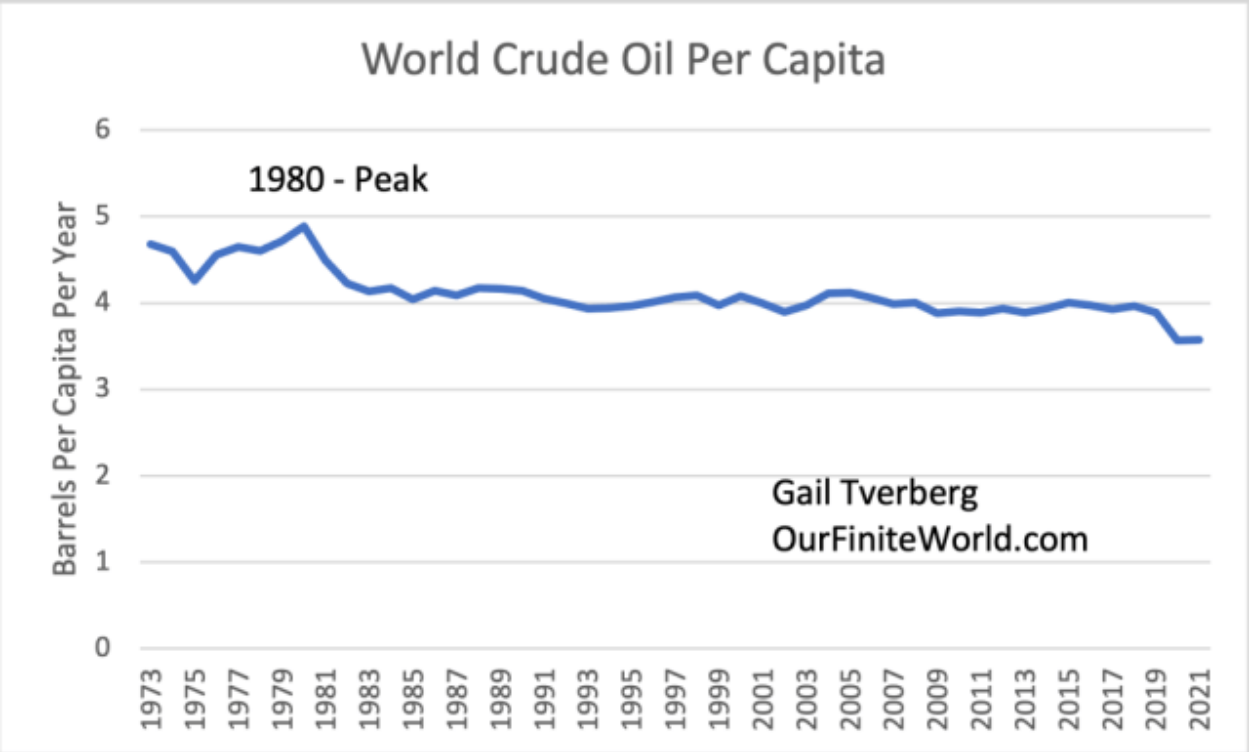


Figure 11. Per capita crude oil production from 1973 through 2021. Crude oil amounts are from international statistics of the US Energy Information Administration. Population estimates are from UN 2019 population estimates. The low population growth projection from the UN data is used for 2021.

At the same time, the world economy was able to expand the use of other energy products, at least through 2018.

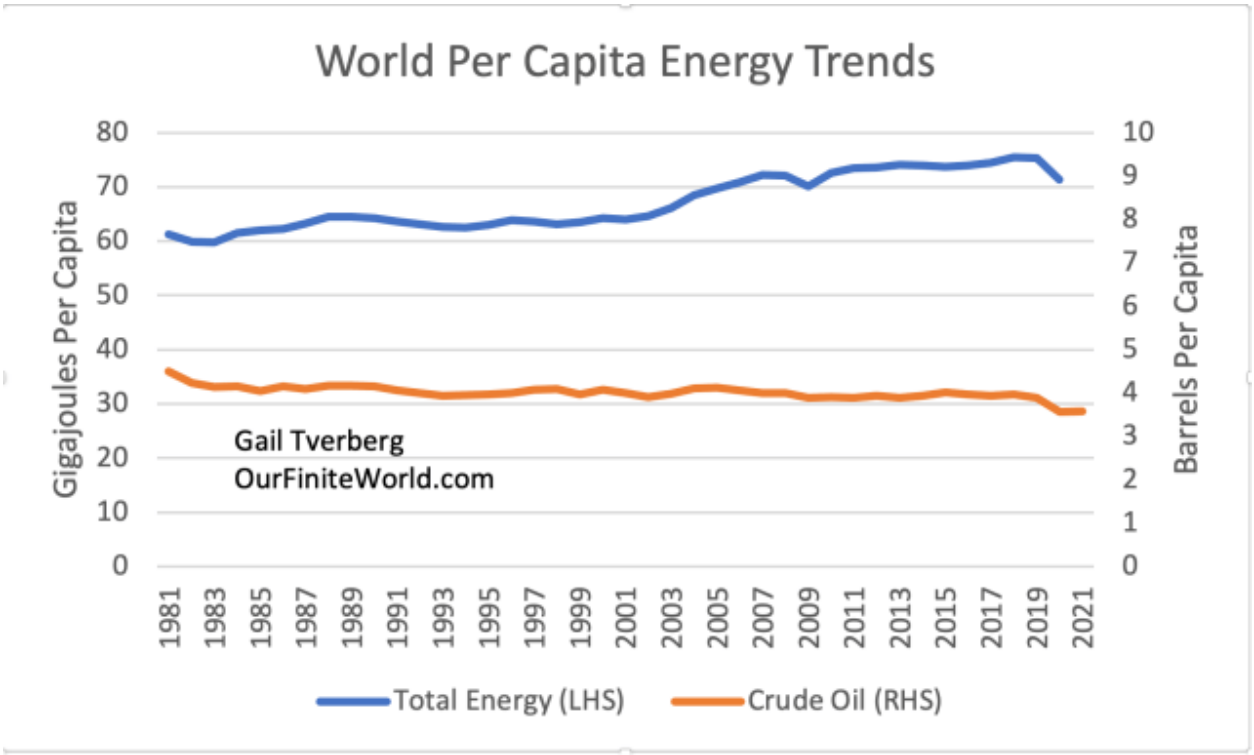


Figure 12. World per capita total energy supply based on data from BP's *2021 Statistical Review of World Energy*. World per capita crude oil is based on international data of the EIA, together with UN 2019 population estimates. Note that crude oil data is through 2021, but total energy amounts are only through 2020.

Since 2019, our problem has been that the total energy supply has not been keeping up with the rising population. The cost of extraction of all kinds of oil, coal and natural gas keeps rising due to depletion, but the ability of customers to afford the higher prices of finished goods and services made with those energy products does not rise to match these higher costs. Energy prices probably would have spiked in 2020 if it were not for COVID-related restrictions. Production of oil, coal and natural gas has not been able to rise sufficiently after the lockdowns for economies to fully re-open. This is the primary reason for the recent spiking of energy prices.

Turning to inflation rates, **the relationship between higher interest rates (Figure 1) and annual inflation rates (Figure 8) is surprisingly not very close**. Inflation rates rose during the 1960 to 1973 period despite rising interest rates, mostly likely because of the rapid growth of the economy from an increased per-capita supply of inexpensive energy.

Figure 8 shows that inflation rates did not come down immediately after interest rates were raised to a high level in 1980, either. There was a decline in the inflation rate to 4% in 1983, but it was not until the collapse of the central government of the Soviet Union in 1991 that inflation rates have tended to stay close to 2% per year.

**[7] A more relevant recent example with respect to the expected impact of rising interest rates is the impact of the increase in US short-term interest rates in the 2004 to 2007**

**period. This led to the subprime debt collapse in the US, associated with the Great Recession of 2008-2009.**

Looking back at Figure 1, one can see the effect of raising short-term interest rates in the 2004 to 2007 era. This eventually led to the Great Recession of 2008-2009. I wrote about this in my academic paper, Oil Supply Limits and the Continuing Financial Crisis, published in the journal *Energy* in 2010.

The situation we are facing today is much more severe than in 2008. The debt bubble is much larger. The shortage of energy products has spread beyond oil to coal and natural gas, as well. The idea of raising interest rates today is very much like going into the Great Depression and deciding to raise interest rates because bankers don't feel like they are getting an adequate share of the goods and services produced by the economy. If there really aren't enough goods and services for everyone, giving lenders a larger share of the total supply cannot work out well.

**[8] The problems we are encountering have been hidden for many years by an outdated understanding of how the economy operates.**

Because of the physics of the economy, it behaves very differently than most people assume. People almost invariably assume that all aspects of the economy can "stay together" regardless of whether there are shortages of energy or of other products. People also assume that shortages will be immediately become obvious through high prices, without realizing the huge role interest rates and debt levels play. People further assume that these spiking prices will somehow bring about greater supply, and the whole system will go on as before. Furthermore, they expect that whatever resources are in the ground, which we have the technical capability to extract, can be extracted.

It is important to note that prices are not necessarily a good indicator of shortages. Just as a fever can have many causes, high prices can have many causes.

The economy can only continue as long as all of its important parts continue. We cannot assume that reported reserves of anything can really be extracted, even if the reserves have been audited by a reliable auditor. What actually can be extracted depends on prices staying high enough to generate funds for additional investment as required. The amount that can be extracted also depends on the continuation of international supply lines providing goods such as steel pipe. The continued existence of governments that can keep order in the areas where extraction is to take place is important, as well.

What we should be most concerned about is a very rapidly shrinking economic system that cannot accommodate very many people. It seems that such a situation might occur if the debt bubble is popped and too many supply lines are broken. There may be a time lag between when interest rates are raised and when the adverse impacts on the economy are seen. This is a reason why central bankers should be very cautious about the increases in interest rates they make as well as QT. The situation may turn out much worse than planned!

**About Gail Tverberg**

My name is Gail Tverberg. I am an actuary interested in finite world issues - oil depletion, natural gas depletion, water shortages, and climate change. Oil limits look very different from what most expect, with high prices leading to recession, and low prices leading to financial problems for oil producers and for oil exporting countries. We are really dealing with a physics problem that affects many parts of the economy at once, including wages and the financial system. I try to look at the overall problem.

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